Grades 3-5

Supporting the Integration of Mathematical Content in K-5 ELD Classroom

Objectives

- Make connections between Arizona's English Language Proficiency Standards (ELPS) and the Mathematical Practices
- Reflect on current practices
- Discuss strategies to support teachers in increasing the use of academic vocabulary and student discussions in the ELD classroom

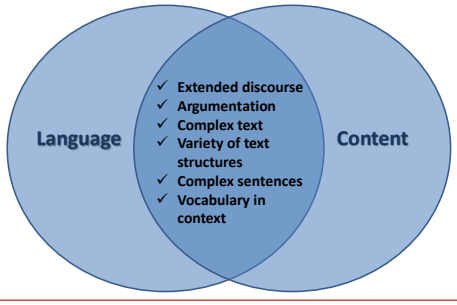
AZCCRS Require

- Language development as a complex process
- Language development aimed at effective communication
- Disciplinary language that goes beyond technical vocabulary to build the communicative competence necessary for participation in disciplinary practices

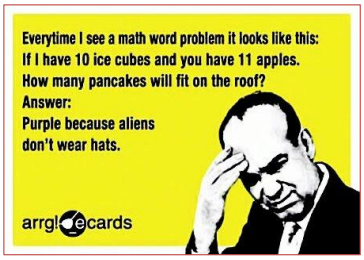
Implications for Instruction

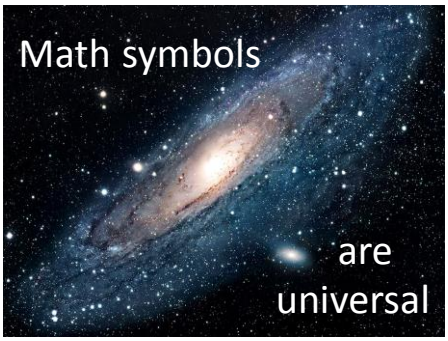
- All students will need to read, write, speak & listen extensively
- The focus of the classroom will need to shift to engage students in disciplinary discourse practices
- Language activities will need to include opportunities to involve students with a variety of modes, representations, types of texts, types of talk, and different audiences

What does it mean to utilize content?



What Makes This Complex for ELLs?





Syntax in Mathematics

"4 is 2 less than 6"

4 is	4 =
2 less than 6	2 – 6

4 = 2 – 6

Mathematical Text

Julie has 1/3 more apples than Lucy. Julie has 16 apples. How many apples does Lucy have?

Reference Table 1 CCSS-M

Fist-to-Five

Mathematical Practices

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

1. Make sense of problems and persevere in solving them 6. Attend to precision	2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others	Reasoning and explaining
	4. Model with mathematics 5. Use appropriate tools strategically	Modeling and using tools
	7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Seeing structure and generalizing

Mathematical Practice 1

Make sense of problems and persevere in solving them

- *Explain* the meaning of the problem
- *Plan* a solution pathway
- *Determine if the solution is reasonable and accurate*
- *Explain* correspondences among models, pictures, diagrams, equations, verbal descriptions, tables, and graphs

Mathematical Practice 3

Construct viable arguments and critique the reasoning of others

- *Explain* the reasoning underlying a strategy, solution or conjecture
- *Arguments* may rely on definitions, previous results, properties or structure
- *Present your arguments*
- *Articulate* and *Justify* generalizations
- *Listen to* or *Read* arguments of others. Ask questions to clarify or improve the argument.
- *Communicate* their arguments, *compare* them to others as well as *respond* to the critiques of others

Mathematical Practice 6

Attend to Precision

- *Formulate* precise explanations
- *Use* math vocabulary
- *Use* appropriate labels to *communicate* the meaning of the representation
- *Record* their work

Shifts in the Usage of Language for Math

From:	To:
Mathematical language as technical vocabulary	Mathematical language as communicative competence
Using language to develop procedural knowledge	Using language to communicate conceptual understanding
Mathematical language as "talk"	Engaging students in using language to construct meaning

Time Allocations and Standards

	Reading	Oral English Conversation &Vocabulary	Writing	Grammar
Time Allocations	60 min	60 min	60 min	60 min
Standards to Use	✓Reading Domain	✓Listening & Speaking Domain ✓Language Strand ▪ Vocabulary	✓Writing Domain	✓Language Strand ▪Grammar

Time Allocations and Standards

Oral English Conversation &Vocabulary

60 min

- ✓**Listening & Speaking Domain**
- ✓**Language Strand**
  - **Vocabulary**

Oral English Conversation & Vocabulary Connection

Academic Language consists of academic vocabulary and is used in academic discourse.

Academic Language includes:

- The language used in the classroom and workplace
- The language of text
- The language of assessment
- The language of academic success
- The language of power

Academic vocabulary is critical to understanding the concepts taught in school. It includes both specialized content vocabulary and high frequency precise vocabulary.

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Academic discourse is a structured dialogue that provides students with the vocabulary and syntax needed to discuss topics using academic language in meaningful contexts.

Stage: ELL Stage II: Grades 1-2

Standard: Language Strand — Domain

Standard 2: The student will acquire English language vocabulary and use it in relevant contexts.

Proficiency Levels

Vocabulary / Concept	Pre-Emergent	Emergent	Basic	Low Intermediate	High Intermediate
	PE-1: repeating and grouping the names of common objects or pictures into basic given categories with instructional support.	E-1: naming and grouping common objects and pictures into given categories with instructional support.	B-1: naming and grouping common objects and pictures with self-selected categories and providing rationale.	LI-1: classifying common words into basic conceptual categories (colors, shapes, foods) and providing rationale.	HI-1: classifying words into conceptual categories and providing rationale.
	PE-2: repeating sight words.	E-2: recognizing sight words with instructional support.	B-2: recognizing sight words.	LI-2: identifying the meaning of and using sight words.	HI-2: identifying the meaning of and using sight words.
	PE-3: repeating high frequency words.	E-3: recognizing high frequency words with instructional support.	B-3: recognizing and identifying the meaning of high frequency words with instructional support.	LI-3: identifying the meaning of and using high frequency words.	HI-3: identifying the meaning of and using high frequency words.

Performance Indicators

Connections to Mathematical Practices

Kinder Video: Table Talk

1. What performance indicator is this instruction addressing?
2. Which mathematical practice is this instruction supporting?

First Grade Video: Table Talk

1. What performance indicator is this instruction addressing?
2. Which mathematical practice is this instruction supporting?

Describe

1. Distribute your cards among the members of your group.
2. Do not show your card.
3. Take turns describing your card using as much detail as possible.

Sentence Frames:

- My picture shows…
- It has ___ parts and…
- It does not have ….
- My graphic contains ___
- My ___ was created by…

Mathematical Terminology:

square	multiple	horizontal
quadrilateral	area	vertical
perimeter	line	array

Sequence

Once all of the cards have been described, decide on an order that makes sense and place the cards.

- Do not look at cards.
- Each person needs to decide where to place their card and provide the rationale for their decision.

Sentence Frames:

- I have the (first, next, last) card because….
- My card should be ____ in the sequence because…
- My ___ (follows, proceeds) ___ because…

Describe and Explain

Independently, In Pairs, or Small Groups

Analyze the Sequence. Take notes and be prepared to discuss your analysis:

- How do you see the shapes growing?
- Can you see it more than one way?
- Can the way you "see" the sequence growing help you determine the next arrangement?

Reasoning and Argumentation

Which has more volume:

100 pounds of feathers or 100 pounds of bricks?

Table Talk

1. How did this activity engage you with the mathematical practices, processes, and language?
2. How did the activity support and challenge ELLs?
3. What kind of supports will teachers need to implement instruction that develops complex language through meaningful use of content?

Language for Classroom Discussion

	Casual Conversational English	Formal Spoken & Written English
Sharing Personal Ideas or Opinions	• I think… • I learned that…	→ I decided that … → I believe that … → I concluded that … → I observed that …
Pointing Out Similarities	• Mine's the same. • Oh yeah. Right. • Me too.	→ My idea is similar to __'s. → My idea builds upon __'s. → I agree with __. → I also think that __.
Expressing Agreement	• Yeah. Right. • Uh huh.	→ I agree with __'s idea that … → I support __'s decision to … → Like __, I support …
Asking for Clarification & Paraphrasing	• Huh? • What? • I don't get it.	→ I don't quite understand. → Could you explain what you mean by __ → If I understand you correctly, you are saying that __

Final Thoughts

- ELLs must have opportunities to engage in quality, sustained, deep interactions to build knowledge.
- Dialogue involves the exchange of ideas and is not dominated by one party.
- Dialogue between peers builds on participant's ideas to promote improved understanding of concepts.
- Knowledge is jointly constructed through the use of language.
- Talk is about the subject matter of the discipline and encourages reasoning, application of ideas, argumentation, forming generalizations, and asking questions.

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